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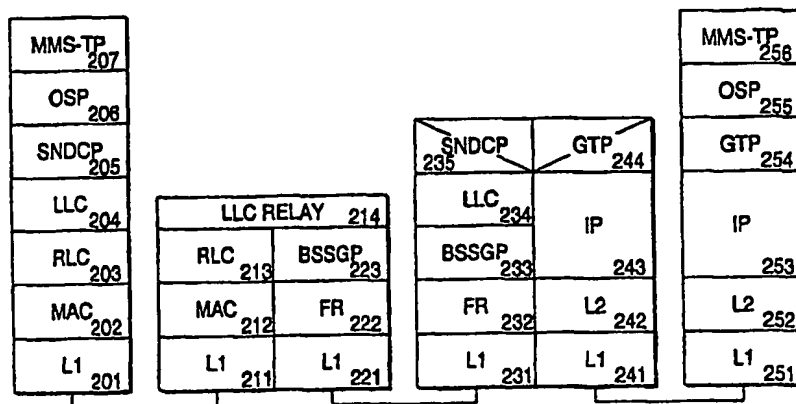
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04Q 7/22, H04L 29/06		A1	(11) International Publication Number: WO 00/56088
			(43) International Publication Date: 21 September 2000 (21.09.00)
(21) International Application Number: PCT/FI00/00206		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 15 March 2000 (15.03.00)			
(30) Priority Data: 990586 16 March 1999 (16.03.99) FI			
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(54) Title: METHOD AND ARRANGEMENT FOR TRANSMITTING MULTIMEDIA-RELATED INFORMATION IN A PACKET-SWITCHED CELLULAR RADIO NETWORK



(57) Abstract

A method is provided for transmitting multimedia-related information between a first device and a second device coupled to a packet-switched data transmission network. A first protocol stack (201, 202, 203, 204, 205, 206, 207) is defined for the first device and a second protocol stack (251, 252, 253, 254, 255, 256) is defined for the second device. The protocol stacks consist of layers and serve the arranging of the mutual exchange of information between the first device and the second device. An octet stream protocol layer (206, 255) is defined for the transmission of unstructured octet streams as a certain layer in the first protocol stack and a certain layer in the second protocol stack. A multimedia messaging transport protocol layer (207, 256) is also defined as a certain layer above the octet stream protocol layer (206, 255) in the first and second protocol stacks. Multimedia-related information is exchanged between the multimedia messaging transport protocol layer (207) in the first device and the multimedia messaging transport protocol layer (256) in the second device through the use of the octet stream protocol layer (206, 255) as well as other lower layers in the first and second protocol stacks.

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Method and arrangement for transmitting multimedia-related information in a packet-switched cellular radio network

5 The invention concerns generally the use of certain protocols and services for conveying certain types of information between the different nodes of a telecommunication network. Especially the invention concerns the transmission of multimedia-related information between a terminal of a cellular radio network and a node computer of a fixed packet-switched network.

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Multimedia is generally understood as the synchronized presentation of audiovisual objects to a user. It is typical to multimedia-related information that it may contain elements of highly different nature, like text, still images, simple graphical elements, video and sound.

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MMS or Multimedia Messaging Service is a proposed way for arranging the delivery of messages containing multimedia-related information from one telecommunication device to another. With "multimedia-related" information we mean both the actual payload data that represents presentable objects and the control information that tells a presentation device how to handle the payload data. According to the proposals, MMS should be applicable for conveying such messages to and from the terminals of packet-switched cellular radio networks such as GPRS (General Packet Radio Service) and the packet-switched parts of UMTS (Universal Mobile Telecommunication System) in a store-and-forward manner much like the SMS (Short Messaging Service) text messages are conveyed in the second generation digital cellular networks, e.g. GSM (Global System for Mobile telecommunications).

Fig. 1 illustrates some system aspects of a known proposal for arranging the transmission of MMS messages between two mobile terminals 101 and 102. In Fig. 1 each terminal is operating in a cellular telephone system of its own: terminal 101 is a UMTS terminal operating in a UMTS network 103 and terminal 102 is an enhanced GSM terminal operating in an enhanced GSM network 104. From both networks there is a connection to a GPRS network 105. The UMTS network 103 comprises a UTRAN or UMTS Terrestrial Radio Access Network 106 as well as a CN or Core Network 107. In the enhanced GSM network 104 a BSS or Base Station Subsystem 108 and an MSC or a Mobile Switching Centre 109 are shown. The detailed structure of the network elements is unessential to the present invention,

- but it is known that for example a UTRAN consists of a number of Radio Network Subsystems, each of which in turn comprises a Radio Network Controller and a number of Node Bs roughly corresponding to base stations. A BSS in turn comprises a Base Station Controller and a number of Base Transceiver Stations operating under it. Various mixed-mode cellular telephone systems are possible; for example the BSS 108 might operate under the same CN as the UTRAN 106. The terminals could also be exactly similar terminals operating close to each other in a single cell.
- 10 In Fig. 1 there is a connection both from the UTRAN 106 and from the BSS 108 to a corresponding SGSN or Serving GPRS Support Node 110 and 111. Both of these are in turn coupled, through the GPRS trunk lines, to a GGSN or Gateway GPRS Support Node 112 which here also operates as an MMSC or a Multimedia Messaging Service Center. In analogy with the known SMS arrangements a terminal
- 15 101 may transmit an MMS message by identifying both the intended recipient's terminal 102 and the MMSC through which the message is to be transmitted (actually the latter may even be left out if there is a default MMSC for each terminal). A Packet Control Unit or a corresponding functionality in the UTRAN 106 takes the MMS transmission and routes it through the current SGSN 110 to the
- 20 MMSC 112 which stores the MMS message and commences the attempts for delivering it to the intended recipient. If there is an existing connection to the recipient's terminal 102 the MMSC may deliver the message through the corresponding SGSN 111 and the BSS 108 to the terminal 102. If, however, the terminal 102 is temporarily shut off, out of coverage or otherwise unreachable, the
- 25 MMSC retries the delivery at certain time intervals until either the message is successfully delivered or a timeout expires indicating that the message is obsolete and can be deleted undelivered. A positive or negative acknowledgement, depending on the success in delivery, may be returned to the transmitting terminal 101 if required.
- 30
- At the time of filing this patent application there does not exist an unambiguously defined way of using the lower-level protocol layers and PDP Contexts (Packet Data Protocol) in the terminals and fixed network devices to convey the MMS messages. Somewhere at a relatively high level in the protocol stacks of both the
- 35 terminals and the MMSC there must be an MMS-TP (Multimedia Messaging Service - Transport Protocol) entity that uses the services offered by the lower level protocols to convey an MMS message first from the transmitting device to the MMSC and then further to the receiving device. Additionally the MMS messages

must be mapped into PDP Contexts of certain type; the mapping will be closely related to the choice of lower protocol layers under the MMS-TP entity. We anticipate that network operators will require the MMS messaging to be distinguishable from other forms of packet-switched data transmission in order to
5 arrange for a suitable charging scheme for the MMS services.

Two prior art solutions have been proposed for conveying MMS messages. One of them is to have a PDP Type separately defined for MMS, and to set up a PDP Context of that type between a terminal and an MMSC each time an MMS message
10 has to be conveyed in either direction. This approach has the drawback of requiring a considerable amount of completely new specification and standardization work. Additionally new PDP Types are only very reluctantly accepted to the already frozen standards. The other proposed prior art approach is to build the MMS messaging on top of the known IP or Internet Protocol PDP Type. The latter
15 approach would require the GGSNs to reserve and allocate dynamic IP addresses to mobile users. The use of dynamic addresses is not efficiently combined to MMS services, and in any case using the IP PDP Type for MMS messaging would consume the scarce IP addresses and involve the whole complexity of allocating and maintaining IP addresses and dynamically configuring hosts. A terminal roaming in
20 another network should in practice always use the MMSC of its home network, because there is no possibility of dynamically telling the IP addresses of other MMSCs to the terminal.

It is an object of the present invention to provide a feasible method and a
25 corresponding arrangement for conveying MMS messages between terminals and MMSCs. It is an additional object of the invention that the proposed method does not require exhaustive respecification in the framework of existing standards and proposals. A further object of the invention is to minimize the required protocol overhead in the MMS traffic between the terminals and the MMSCs. An even
30 further object of the invention is to provide means for distinguishing the MMS traffic from other types of packet-switched information transfer.

The objects of the invention are met by using the OSP or Octet Stream Protocol, known as such, to carry a data stream comprising the required multimedia-related
35 information.

The method according to the invention is characterized in that it comprises the steps of

- defining a multimedia messaging transport protocol layer as a certain layer above an octet stream protocol layer in certain first and second protocol stacks and
- exchanging multimedia-related information between the multimedia messaging transport protocol layer in a first device and the multimedia messaging transport protocol layer in a second device through the use of the octet stream protocol layer as well as other lower layers in the first and second protocol stacks.

The invention also applies to a terminal which is characterized in that its control block is arranged to

- implement a multimedia messaging transport protocol layer in a protocol stack and
- exchange multimedia-related information between said multimedia messaging transport protocol layer in the protocol stack and a network device through the use of an octet stream protocol layer as well as other lower layers in the protocol stack..

- Additionally the invention applies to a network device which is characterized in that its control block is arranged to
- implement a multimedia messaging transport protocol layer in a protocol stack and
 - exchange multimedia-related information between said multimedia messaging transport protocol layer in the protocol stack and a terminal through the use of an octet stream protocol layer as well as other lower layers in the protocol stack.

- The Octet Stream Protocol or OSP is a previously defined way in GPRS for carrying relatively unstructured information in the form of octet streams between a mobile terminal and a GGSN. An octet is a group of eight consecutive bits. There exists a ready specified PDP Type for OSP, and in the known protocol stacks related to GPRS the OPS entity is directly on top of the SNDSCP (Subnetwork Dependent Convergence Protocol) layer in the terminal and on top of the GTP (GPRS Tunneling Protocol) in the GGSN. According to the invention the MMS-TP protocol entity will be placed on top of the respective OSP entities in the terminal and the MMSC.

- A PDP Context activation procedure between a terminal and a MMSC is required to enable the transmission of MMS messages in the framework of OSP. The device that initiates the activation procedure transmits an Activate PDP Context Request that contains a set of parameters that are required to identify and define the desired PDP Context. In the case of terminal-initiated PDP Context activation the SGSN may need to select the appropriate GGSN on the basis of the parameters contained within the activation request and possibly using also previously stored information

about the home location of the terminal. If the MMSC functionality is not implemented within a GGSN, a specific interface may be needed to define the transmission of information therebetween.

- 5 After the PDP Context setup has been accomplished, MMS messages are conveyed as an octet stream by using either the octet mode, where the OSP protocol entity applies a packet assembly / disassembly function, or the block mode where no separate packet assembling or disassembling is performed.
- 10 The invention has several advantageous features. Using OSP as the bearer for MMS makes it possible to minimize protocol overheads because OSP does not require a large amount of associated control information. The PDP Context used to convey MMS messages may be completely separated from all other PDP Contexts even without defining a new PDP Type, which makes it easy to define a separate
- 15 charging scheme for MMS. No IP addresses or other addresses of an external network are required for the transmission of MMS messages, which decreases configuration efforts, bypasses dynamic address allocation procedures and saves the operators from assigning static external network addresses to all users wishing to use MMS. Only the terminal and the MMSC or GGSN must interpret the data
- 20 travelling through a "transparent tunnel" between a terminal and a SGSN on one hand and between a SGSN and a GGSN on the other hand.

The utilization of an unstructured octet stream between a terminal and a MMSC or GGSN enables the operators to direct the MMS-carrying PDP Contexts of desired

25 users always to a particular MMSC/GGSN; for example the one residing in the user's home network. On the other hand, operators may also allow any MMSCs to be used, but this may restrict the service to the mobile-originated alternative only. In any case the control possibilities are much more flexible than in the IP-based prior art solutions. A terminal may even select a desired MMSC / GGSN by using a

30 certain predefined parameter in an Activate PDP Context Request.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended Claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and

35 advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

Fig. 1 illustrates some known system aspects of packet-switched data transmission,

Fig. 2 illustrates an arrangement of protocol stacks according to the invention,

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Fig. 3 is a schematic illustration of a method according to the invention,

Fig. 4 is a schematic illustration of an Activate PDP Context Request used in association with the invention,

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Fig. 5 illustrates schematically an arrangement according to the invention and

Fig. 6 summarizes some aspects of certain protocol layers according to the invention.

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Fig. 1 has been already discussed above within the description of prior art.

Fig. 2 illustrates an advantageous arrangement of protocol stacks in a terminal or Mobile Station (MS), an Base Station Subsystem (BSS), a Serving GPRS Support Node (SGSN) and a Multimedia Messaging Service Center (MMSC). The notation refers to the application of the invention in association with an enhanced GSM network; this should not be construed as an implicit limitation to the applicability of the invention. In the context of UMTS, for example, the terminal would be designated as the UE (User Equipment) and the BSS would be substituted by one of the network devices belonging to a UTRAN, e.g. a Node B or a Radio Network Controller. Within the BSS or the UTRAN there may be a specific interface unit that takes care of all data traffic to and from such packet data networks that do not share the switching facilities (the core networks) with the cellular telephone systems.

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The protocol layers related to the application of the invention in the MS are, from bottom to top, Layer 1 201, Medium Access Control 202, Radio Link Control 203, Logical Link Control 204, Subnetwork Dependent Convergence Protocol 205, Octet Stream Protocol 206 and Multimedia Messaging Service - Transport Protocol 207. Some sources refer to some of these layers as sublayers, which has no practical importance to the present invention. It has to be noted that the "MS" is a general notation for the apparatus or arrangement of apparatuses which are operative at a terminal end: one possible "MS" arrangement is a mobile telephone or other cellular

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network terminal coupled to a laptop computer, whereby for example the OSP protocol layer 206 may reside in the mobile telephone and the MMS-TP protocol layer 207 may reside in the laptop computer.

- 5 On the left-hand side of the BSS the three lowest layers 211, 212 and 213 are the same and on top of them there is LLC Relay layer 214 for performing the required conversions between the left-hand and right-hand sides of the BSS. The three right-hand layers of the BSS are, from bottom to top, Layer 1 221, Frame Relay layer 222 and BSS GPRS Protocol layer 223. In the SGSN the three lowest left-hand side
10 layers 231, 232 and 233 are same as on the right-hand side of the BSS, and above them is the Logical Link Control layer 234 which is the peer entity of the similarly named layer in the MS. On the right-hand side of the SGSN there are the Layer 1 241, Layer 2 242 and Internet Protocol 243 layers. On top of the SGSN protocol stack there is a conversion entity consisting of an SNDCP half 235 and a GPRS
15 Tunneling Protocol half 244. The protocol layers of the MMSC are, from bottom to top, Layer 1 251, Layer 2 252, Internet Protocol 253, GPRS Tunneling Protocol 254, Octet Stream Protocol 255 and Multimedia Messaging Service - Transport Protocol 256.
- 20 Also at the GGSN/MMSC end there may be a division of the protocol layers to those implemented within an actual GGSN (e.g. layers 251 to 255) and those implemented within a separate MMSC entity (e.g. layer 256).

25 The use of the above-mentioned protocol layers in context of the present invention is explained in more detail in the following, with reference also to Figs. 3 and 4. As an example we will use a mobile-originated procedure for enabling the exchange of MMS messages between a MS and a MMSC. At step 301 the MS transmits an Activate PDP Context Request message in a way basically known as such. In order to use said message to set up a PDP Context suitable for MMS transmission using
30 the OSP, the MS needs to incorporate a certain set of parameters in the message. These parameters are schematically illustrated in Fig. 4 and they have the following meaning:

- * The Network Service Access Point Identifier or NSAPI 401 is selected by the MS.
35 NSAPI identifies the PDP context to be activated within the GPRS/UMTS network. For identifying the user the message comprises also the TLLI (Temporary Logical Link Identity) and IMSI (International Mobile Subscriber Identity) information elements (not shown in Fig. 4).

- 5 * The PDP Type 402 shall have a two-part value. The first part 402a shall identify the protocol as OSP, and the second part 402b shall identify the service being used and thereby allow the SGSN to select a GGSN (i.e. MMSC in this case) that can provide the service. The two-part value of the PDP Type field can be expressed as OSP:MMS. This is a new OSP type that does not exist in the standards at the priority date of this patent application but introduced by this invention.
- * The PDP Address field 403 is most advantageously empty.
- 10 * The Access Point Name or APN 404 is selected by the MS. The selected APN identifies the GGSN and MMSC which the MS wants to use for this context. The actual APN to be used (i.e. GGSN and MMSC to be used) can be restricted by the operator by subscription. If that is the case, the HLR (Home Location Register) record of each user for multimedia messaging context includes the APN that is always used for MMS contexts. The MS may omit the APN from the Activate PDP Context Request message if the APN is configured in the HLR. Otherwise the user
- 15 may include an APN in the message. If there is no APN in the message and no APN is configured in the HLR, the SGSN is free to choose any GGSN/MMSC for multimedia messaging context (If Dynamic Allocation in the visited network is allowed by the HLR record).
- 20 * The QoS Requested 405 (where QoS comes from Quality of Service) is selected by the MS. The requested service quality comprises a number of factors and their selection typically depends on the desired characteristics of the MMS-TP. Of the known reliability classes, class 2 is seen as the most advantageous, meaning RLC&LLC retransmissions as well as the use of UDP (User Datagram Protocol) at the GPRS backbone network. Bit rates can be negotiated to be anything without the
- 25 invention limiting their negotiation. MMS message transmission is in general time-insensitive, so delay class should reflect that; long delays are allowed. Service precedence is most advantageously high if it indicates dropping precedence which results in few packet losses.
- 30 * The PDP Configuration Options field 406 can be used e.g. for informing the MMSC about certain capabilities of the MS, such as supported content-types etc. MS-MMSC configuration information can be included in this information element if these are not implemented into the MMS-TP protocol itself. If there are many choices for the MMS-TP protocol (either totally separate protocols or different versions of the same protocol), the PDP Configuration options can be used for
- 35 informing the MMSC which protocol(s) the MS supports on top of OSP.

At step 302 the BSS recognizes the Activate PDP Context Request message as concerning packet-switched services and consequently routes it to the current SGSN

in a known way. At step 303 the SGSN selects the GGSN based on the HLR records and/or the MS-provided APN string. At step 304 the GGSN receives the message and recognizes from the context type that the new context is for MMS. If the MMSC functionality is not incorporated into the GGSN itself, the GGSN would additionally select an external MMSC element based on the APN in the context activation at step 304. A proprietary interface or some standard (e.g. TCP/UDP socket interface) can in this case be provided between the GGSN and the MMSC. The GGSN/MMSC creates an association with the service attributes and the established tunnel (identified by TID consisting of the user's IMSI and the NSAPI value of the PDP context).

After activating the service and possibly configuring some MMS-related parameters (e.g. according to the information delivered in the Protocol Configuration Options information element), the GGSN/MMSC sends at step 305 a PDP Context Activation Response message via the SGSN to the MS. The reception of this message at the MS finalizes the context activation. No PDP address need to be assigned for the context, although such an assignment is not precluded by the invention. After that, there is a logical tunnel in place between the MS and the GGSN, where MMS-TP protocol messages can be delivered transparently as illustrated by block 307.

The activation of the PDP Context for transmitting MMS messages may also take place upon the initiative of the MMSC, for example in such a case where an MMS message has been stored for delivery to an MS which currently does not have an active PDP Context with the MMSC. According to the adopted practice within GPRS, the MS is always the one to transmit the initial Activate PDP Context Request message, but it is possible for the MMSC to indicate to the MS through a simple signalling message that there is a stored MMS message waiting for delivery, so that it is left to the MS's discretion to choose the moment for activating the PDP Context by commencing the procedures illustrated in Fig. 3. In other network arrangements an MMSC-originating PDP Context activation (though probably with different designations of the participating devices and associated messages) could be nearly identical to the MS-originating one described above, with the exception that the initial activation message and the response thereto would travel into opposite directions than above. The identification information in the former would then serve to identify a particular MS instead of a SGSN-GGSN/MMSC combination, whereby the routing of the message could involve the known inquiries to the location registers which store the current location information of the MS.

There exists even a possibility of allocating a fixed NSAPI to identify a PDP Context of the OSP:MMS type, whereby an explicit PDP Context activation between the MS and the MMSC could be completely avoided. In such a case the occurrence of said fixed NSAPI in a packet would immediately indicate to all the devices taking part in the communication that the packet carries multimedia-related information, so especially the BSS and the SGSN could arrange its routing accordingly. The IMSI and the NSAPI together, as well as with possible other identification information of the packet, serve to identify the MS to which such a packet belongs. A specific APN entry would probably be required in each user's HLR records so that a SGSN would find the correct GGSN/MMSC for each user.

Fig. 5 illustrates an arrangement according to the invention comprising a terminal or MS (or UE) 501, a BSS or UTRAN 502, a SGSN 503 and a combined GGSN/MMSC 504. The hardware of the terminal comprises a radio transceiver block 512, a decoding/demultiplexing block 513, an encoding/multiplexing block 514, a control block 515 and a user data part 516. The decoding/demultiplexing block 513 is arranged to separate received signalling information from received user data and to direct the former into the control block 515; similarly the encoding/multiplexing block 514 is arranged to take signalling information from the control block 515 and to multiplex it for transmission with user data coming from the user data part 516. All other blocks operate under the supervision of the control block. The control connections are shown with thinner lines than the user data and signalling information connections. The MS protocol stack seen in greater detail in Fig. 2 is implemented within the control block 515 by programming the corresponding operations into a memory in the form of machine-readable processing instructions. If the terminal arrangement comprises a number of separate functional entities, the control block may be understood to consist of the control functions distributed into the physical controlling entities of the separate devices.

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The MMSC is basically a large-capacity data storage 521 with a transmission unit 522 arranged to couple it to the trunk lines of the GPRS network (or a corresponding packet data network) as well as a control unit 523 to control the setting up, maintaining and tearing down of connections. The MMSC protocol stack seen in greater detail in Fig. 2 is implemented within the control block 523 by programming the corresponding operations into a memory in the form of machine-readable processing instructions.

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Fig. 6 summarizes the functions of the MMS-TP, OSP and lower protocol layers in all such protocol stacks where the MMS-TP and OSP layers are located. The MMS-TP protocol layer 601 is arranged to indicate to the OSP layer 602 the need for setting up a OSP:MMS type PDP Context with a first primitive 603; this primitive should contain at least the APN, QoS Requested and PDP Configuration Options information elements referred to above. The OSP layer 602 is in general capable of indicating to the lower layers the need for setting up PDP Contexts, and especially capable of indicating with a setup request primitive 604 that a PDP Context of the OSP:MMS type should be requested. This second primitive 604 should contain at least the PDP Type, APN, QoS Requested and PDP Configuration Options information elements referred to above. The lower layers are in general capable of informing the OPS layer 602 about the completed activation of the PDP Context with a third primitive 605, and the OPS layer 602 is in turn capable of forwarding the same information to the MMS-TP layer 601 in a fourth primitive 606.

During operation the MMS-TP layer 601 is arranged to exchange user data with the OSP layer according to the arrow 607, and the OSP layer is arranged to transmit the user data to be transmitted further down in the protocol stack according to arrow 608 either in the octet mode or in the block mode. The former refers to the known use of a PAD or Packet Assembly / Disassembly function to assemble /disassemble a number of octets into / from a single packet for more effective transport by the underlying protocols. The block mode refers to the bypassing of the PAD function, whereby the MMS-TP layer 601 provides the message data to the OSP layer 602 in blocks of octets, and each block of octets is delivered as a single OSP PDU (Protocol Data Unit) to the underlying layers. The block mode is regarded as more advantageous for use in association with the invention, because each MMS message could be handled as an independent block of octets between the MMS-TP layer 601 and the OSP layer 602.

Tearing down of the OSP:MMS type PDP Context follows the known procedures of tearing down PDP Contexts.

Claims

1. A method for transmitting multimedia-related information between a terminal arrangement and a network device arrangement coupled to a packet-switched data transmission network, comprising the steps of
 - 5 - defining a first protocol stack (201,202,203,204,205,206,207) for the terminal arrangement and a second protocol stack (251, 252, 253, 254, 255, 256) for the network device arrangement, the protocol stacks consisting of layers, for arranging the mutual exchange of information between the terminal arrangement and the network device arrangement and
 - 10 - defining an octet stream protocol layer (206, 255) for the transmission of unstructured octet streams as a certain layer in the first protocol stack and a certain layer in the second protocol stack,
characterized in that it additionally comprises the steps of
 - defining a multimedia messaging transport protocol layer (207, 256) as a certain
 - 15 layer above the octet stream protocol layer (206, 255) in the first and second protocol stacks and
 - exchanging multimedia-related information between the multimedia messaging transport protocol layer (207) in the terminal arrangement and the multimedia messaging transport protocol layer (256) in the network device arrangement through
 - 20 the use of the octet stream protocol layer (206, 255) as well as other lower layers in the first and second protocol stacks.
2. A method according to claim 1, characterized in that comprises the step of
25 defining a default PDP Context between the terminal arrangement and the network device arrangement for the exchange of multimedia-related information, said default PDP Context being of a specific type defined for the exchange of multimedia-related information and existing without explicit PDP Context activation.
3. A method according to claim 1, characterized in that comprises the step of
30 activating a PDP Context (301, 305) between the terminal arrangement and the network device arrangement for the exchange of multimedia-related information, said PDP Context being of a specific type defined for the exchange of multimedia-related information.
- 35 4. A method according to claim 3, characterized in that the activation of the PDP Context involves the transmission of an Activate PDP Context message (301) comprising

- a Network Service Access Point Identifier (401) for identifying the PDP context to be activated,
- a PDP Type value (402) for identifying the protocol as an octet stream protocol and for identifying the service being used as the transmission of multimedia-related information,
- an Access Point Name (404) for identifying the intended recipient device of the Activate PDP Context message,
- a QoS Requested field (405) for indicating the requested quality of service for the PDP context to be activated and
- a PDP Configuration Options field 406 for carrying other information related to the PDP context to be activated.

5. A terminal arrangement for exchanging multimedia-related information with a network device arrangement through a packet-switched data transmission network, comprising
- a radio transceiver block (512),
 - a control entity (515),
 - a user data part (516)
 - a decoding/demultiplexing block (513) arranged to separate received signalling information from received user data and to direct the former into the control entity (515) and
 - an encoding/multiplexing block (514) arranged to take signalling information from the control entity (515) and to multiplex it for transmission with user data coming from the user data part (516);
- wherein the control entity is arranged to implement a protocol stack and an octet stream protocol layer (206) for the transmission of unstructured octet streams as a certain layer in the protocol stack, for arranging the mutual exchange of information between the terminal arrangement and the network device arrangement, characterized in that the control entity is arranged to
- implement a multimedia messaging transport protocol layer (207) in the protocol stack and
 - exchange multimedia-related information between said multimedia messaging transport protocol layer (207) in the protocol stack and the network device arrangement through the use of the octet stream protocol layer (206) as well as other lower layers in the protocol stack.

6. A terminal arrangement according to claim 5, characterized in that it comprises a communication device and a presentation device coupled to said

communication device, whereby the control entity consists of parts distributed into said communication device and said presentation device, so that said octet stream protocol layer (206) is implemented in said communication device and said multimedia messaging transport protocol layer (207) is implemented in said presentation device.

7. A network device arrangement for exchanging multimedia-related information with a terminal arrangement through a packet-switched data transmission network, comprising

- a transmission unit (522),
- a control entity (523) and
- a data storage (521);

wherein the control entity is arranged to implement a protocol stack and an octet stream protocol layer (255) for the transmission of unstructured octet streams as a certain layer in the protocol stack for arranging the mutual exchange of information between the network device arrangement and the terminal arrangement,

- characterized in that the control entity is arranged to
- implement a multimedia messaging transport protocol layer (256) in the protocol stack and
 - exchange multimedia-related information between said multimedia messaging transport protocol layer (256) in the protocol stack and the terminal arrangement through the use of the octet stream protocol layer (255) as well as other lower layers in the protocol stack.

8. A network device arrangement according to claim 7, characterized in that it comprises a node device of the packet-switched data transmission network and a multimedia messaging device coupled to said node device, whereby the control entity consists of parts distributed into said node device and said multimedia messaging device, so that said octet stream protocol layer (255) is implemented in said node device and said multimedia messaging transport protocol layer (256) is implemented in said multimedia messaging device.

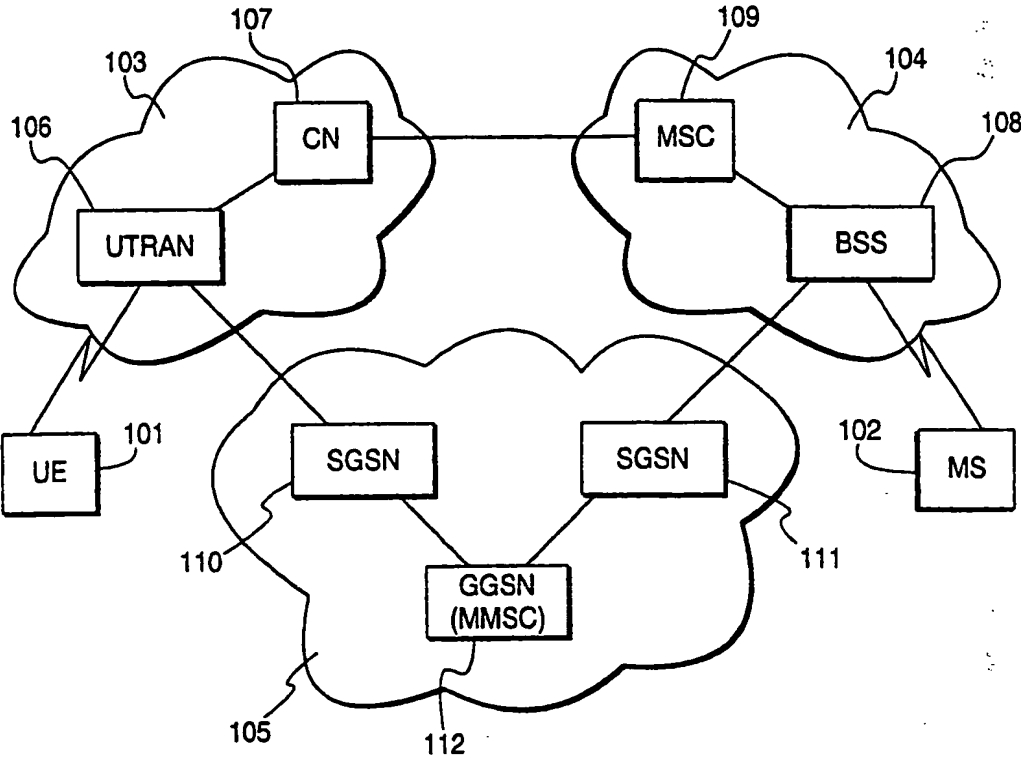


Fig. 1
PRIOR ART

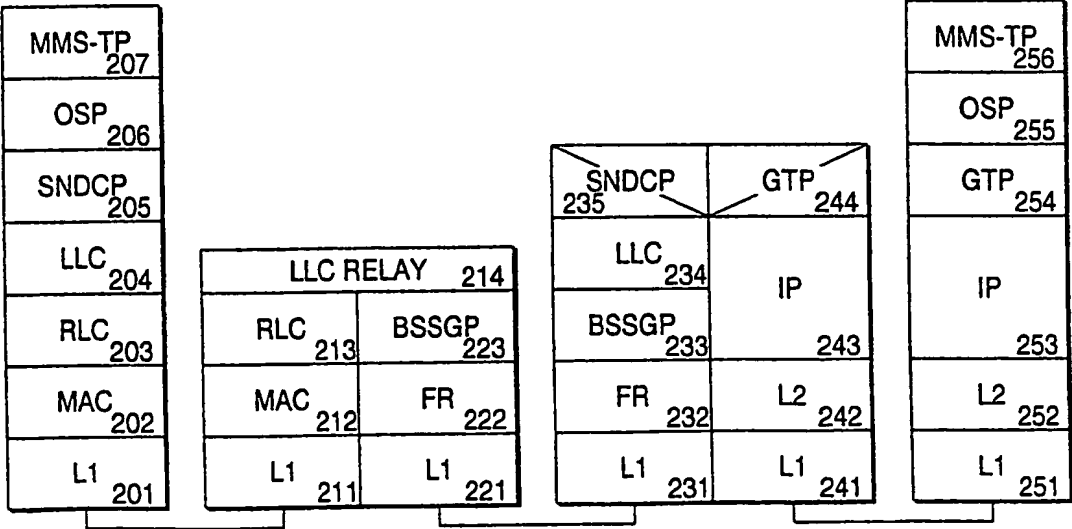


Fig. 2

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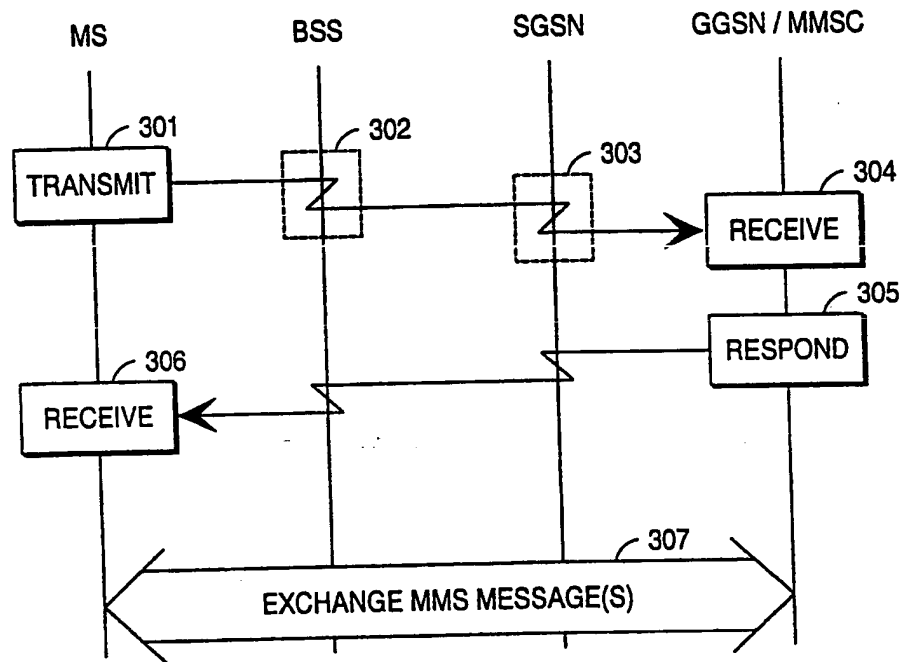


Fig. 3

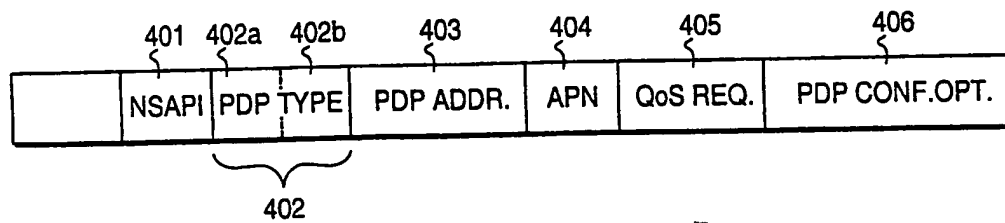


Fig. 4

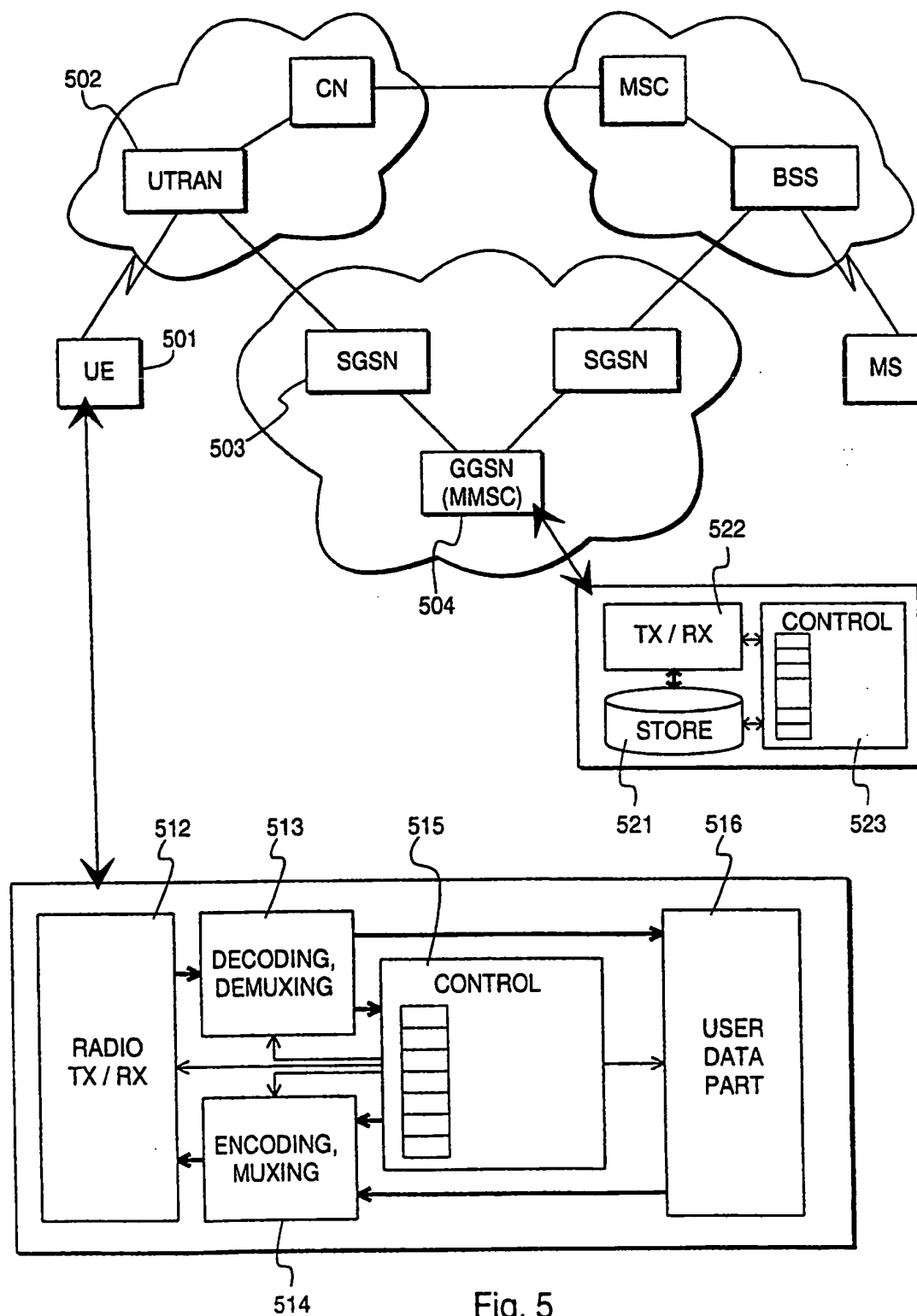


Fig. 5

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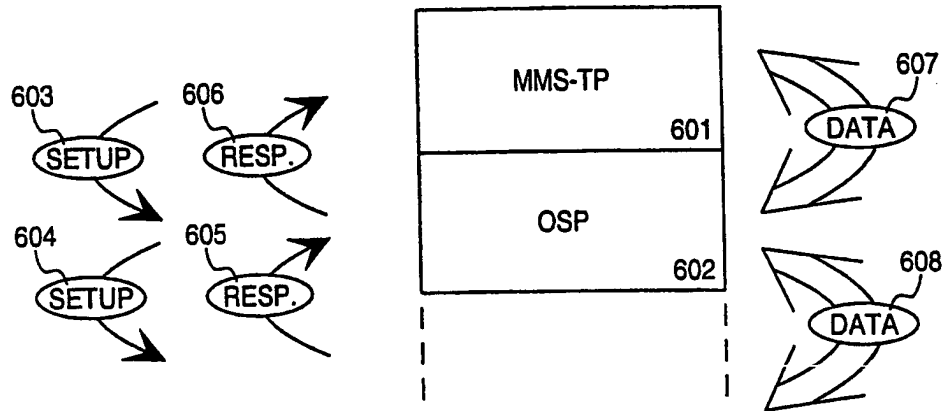


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00206

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/22, H04L 29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,Y	ETSI EN 301 344, V7.1.1 (2000-01) "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2" (GSM 03.60 version 7.1.1 Release 1998); chapter 9, page 58 - page 70, paragraph 12.4; page 74 - page 76, paragraph 13.2 - paragraph 13.4; page 83 - page 86, annex B; page 104 - page 106 --	1-8
P,Y	SEVANTO, J. "Multimedia messaging service for GPRS and UMTS" In: IEEE Wireless Communications and Networking Conference, 1999, 21-24 Sept. 1999. Vol. 3, p. 1422 - 1426, see the whole document --	1-8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

12 July 2000

Date of mailing of the international search report

17 -07- 2000

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00206

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98/56197 A1 (TELIA AB), 10 December 1998 (10.12.98), abstract --	1,5,7
T	ETSI TS 123 140, V3.0.1 (2000-03) "Universal Mobile Telecommunications System (UMTS); Multimedia Messaging Service (MMS), Functional description; Stage 2" (3G TS 23.140 version 3.0.1 Release 1999) chapter 4-7 page 8 - page 18 -- -----	1-8

Information on patent family members

02/12/99

International application No.

PCT/FI 00/00206

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 98/56197 A1	10/12/98	NONE	

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